BY ORDER OF THE SECRETARY OF THE AIR FORCE

AIR FORCE OCCUPATIONAL SAFETY AND HEALTH STANDARD 48-22

21 MARCH 1994

Occupational Health

OCCUPATIONAL EXPOSURE TO HAZARDOUS CHEMICALS IN LABORATORIES

OPR: HQ AFMOA/SGPA (Lt Col Skip Edwards)

Certified by: HQ AFMOA/SGP
(Brig Gen Peter F. Hoffman)
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This standard implements the Occupational Safety and Health Administration (OSHA) Standard 29 CFR 1910.1450, *Occupational Exposure to Hazardous Chemicals in Laboratories*, for Air Force laboratories meeting the definition of a laboratory in that regulation. That OSHA regulation and this standard comprise a unit which prescribes the minimum requirements for an effective chemical hygiene program for Air Force laboratories. The most recent revision of the OSHA regulation can be found in OSHA Publication 2077, Volume I, General Industry Standards and Interpretations. Major Commands (MAJCOMs), direct reporting units (DRUs), and field operating agencies (FOAs) may not waive any of these requirements, but may supplement this standard when additional or more stringent criteria are required. Conflicts in guidance between this standard and other Air Force or federal directives must be reported through the MAJCOM/DRU/FOA surgeons to HQ USAF/SGPA, 170 Luke Avenue, Suite 400, Bolling AFB DC 20332-5113. Refer to AFI 91-301, *Air Force Occupational Safety, Fire Prevention and Health (AFOSH) Program* (formerly Air Force Regulation 127-12), for instructions on processing supplements and variances.

Implementation of this AFOSH Standard shall supersede, for laboratories, the requirements of all other OSHA Health Standards contained in 29 CFR 1910, Subpart Z, *Toxic and Hazardous Substances*, except as noted in 29 CFR 1910.1450 (a) (2). The procedural requirements found in the AFOSH Standards listed in paragraph 8.a. of this standard and the labeling requirements found in AFOSH Standard 161-21, *Hazard Communication*, are superseded by this AFOSH Standard. Other requirements, such as the Occupational Exposure Limits (OELs) and the Standardized Occupational Health Program, are not altered for laboratory operations.

This standard contains the requirements for a Chemical Hygiene Plan (CHP), assigns responsibilities, and provides guidance for protecting workers from the health hazards presented by hazardous chemicals used in the laboratory work environment. It applies to laboratory operations, as defined in 29 CFR 1910. 1450, performed by United States (US) civilian and military employees and direct hire foreign nationals (as established by the Status of Forces Agreements) of the Air Force, Air National Guard, and Air Force Reserve. Government-owned, contractor-operated (GOCO) laboratories within the continental United States (CONUS) or US territories shall implement 29 CFR 1910.1450. GOCO laboratories located out-

side the regulatory jurisdiction of the CONUS or the US territories who are not covered by the Occupational Safety and Health Act shall comply with this standard in response to Federal Acquisition Regulation (FAR), Clause 52.223.3, *Hazardous Material Safety Data*, and Defense Federal Acquisition Regulation Supplement (DFARS), Clause 252. 233-7001, *Hazard Warning Labels.* Contracting Officers shall include this clause in the appropriate section of the contract.

Section A—General Information

1. Scope:

1.1. This standard does not apply to uses of hazardous chemicals that do not meet the definitions of Laboratory Scale and Laboratory Use of Hazardous Chemicals (29 CFR 1910.1450 (b)). These definitions typically encompass educational, histopathology, clinical, and small experimental laboratories. They specifically exclude routine tests or operations that are part of, or adjunct to, a production operation. For that reason, this standard usually will not apply to dental, pharmacy, nondestructive inspection (NDI), precision measurement equipment laboratories (PMEL), and quality control labs.

1.2. This standard also does not apply to laboratory operations that rely solely on prepackaged, commercially-prepared kits. Most bioenvironmental engineering and drinking water test procedures rely on these kits and, therefore, these laboratories would not be covered by this standard.

2. Hazards/Human Factors:

2.1. Hazards. Chemical laboratory hazards can be divided into two categories: health hazards and physical hazards.

2.1.1. Health hazards. Health hazards can be caused by routine exposure to chemical stresses that can produce toxic effects from long-term (chronic) exposures, short-term (acute) exposures, or both. Chemical exposures in a laboratory can occur through inhalation, ingestion, absorption through the skin, and skin surface contact. Health effects from these exposures vary from minor irritation and temporary illness to permanent organ damage and the formation of cancer. When certain substances are absorbed by the human body in combination, they produce greater damage than when absorbed separately. These effects are called "synergistic. " Synergistic effects pose a concern in laboratories because laboratory workers often use many different substances together to produce reactions.

2.1.2. Physical hazards from chemicals include fires and explosions. Preventing fires and explosions caused by mixing incompatible materials require increased attention during laboratory operations. Other safety hazards associated with use of laboratory chemicals include splashes, spills, and incidents involving broken containers.

2.1.3. Physical stresses from ionizing and non ionizing radiation would not normally be significant in laboratory operations but may require attention during maintenance of analytical equipment.

2.1.4. The evaluation and control of biological hazards associated with laboratory operations will be made in accordance with 29 CFR Part 1910.1030, *Occupational Exposure to Blood-borne Pathogens*.

2.2. Human Factors. Laboratory employees informed of the hazardous properties of chemicals and their controls will be less likely to be injured by these health and physical hazards. The training, label-

ing, and chemical hygiene requirement in this standard are designed to enhance health and safety awareness among workers, supervisors, and management.

Section B—Responsibilities

3. Organization and Individual Responsibilities:

3.1. MAJCOM Headquarters.

- MAJCOMs may designate qualifications or specialties, such as the base bioenvironmental engineer, to act as the CHO for specific laboratories.
- MAJCOM/SG resolves questions regarding the definition of "laboratory" as it applies to facilities within the command.

3.2. Unit Commander/Director/Functional Manager. The unit commander/director/functional manager:

- has ultimate responsibility for chemical hygiene within a laboratory,
- appoints the chemical hygiene officer (CHO),
- approves the chemical hygiene plan (CHP), and
- supports the CHP.

3.3. Chemical Hygiene Officer (CHO). The CHO:

- develops, implements, and maintains the CHP;
- coordinates the protective measures with the base bioenvironmental engineer;
- monitors procurement, use, and disposal of chemicals;
- routinely audits and documents compliance with the CHP; and
- reports the status of chemical hygiene compliance to the laboratory supervisor.

3.4. Laboratory Supervisor. The laboratory supervisor has overall responsibility for chemical hygiene in the laboratory and implements measures to:

- maintain a hazardous material inventory,
- ensure employees know and follow chemical hygiene procedures,
- maintain adequate supplies of protective equipment,
- repeatedly inspect chemical hygiene procedures and emergency equipment, and
- ensure training and facilities are adequate.

3.5. Employee. The employee:

- maintains familiarity with the CHP, and
- conducts each operation according to procedures institutionalized in the CHP.

3.6. Assigned or Attending Bioenvironmental Engineer (BEE). The BEE:

- serves as the principal advisor and contact for chemical hygiene matters,
- coordinates on both the draft and the final CHP,

- assists the CHO in determining methods to detect the release of a hazardous chemical and in developing measures to protect employees from chemical hygiene hazards, and
- as a member of the hazardous material emergency planning team, should consult or coordinate with this team the emergency procedures to be used in the laboratory.

3.7. The Bioenvironmental Engineering Service (BES). The BES:

- will maintain a copy of OSHA Publication 2077 (to order, see Section B, Air Force Index (AFIND) 17, *Air Force Occupational Safety and Health(AFOSH) Standards*, Department of Labor Safety and Health Standards (OSHA), and National Institute for Occupational Safety and Health (NIOSH) Publications),
- informs CHOs of changes and interpretations that might affect laboratory procedures,
- evaluates the potential chemical hygiene hazards and the adequacy of the CHP at least annually,
- conducts employee exposure determinations, and
- informs the employee of monitoring results.

3.8. Base Military Public Health (MPH). The MPH arranges and conducts training for laboratory supervisors and CHOs on the potential chemical hygiene hazards identified in their laboratories.

3.9. Base Ground Safety, Environmental Management, and Fire Prevention Office. The base ground safety and fire prevention officials are the primary contacts for matters pertaining to explosion and fire. Fire protection, safety and environmental management personnel should be requested to assist MPH in the training to provide their respective disposal requirements.

Section C—Requirements

4. General Requirements. The elements of a complete laboratory safety and health program include: a written chemical hygiene plan, standard operating procedures, the appointment of a chemical hygiene officer, properly maintained laboratory-type hoods and protective equipment, employee information and training, hazard identification through use of labels and material safety data sheets (MSDSs), employee exposure determinations, and medical consultation/examination. These elements shall be addressed for all Air Force operations which are defined as "laboratories" under this standard.

5. Specific Requirements:

5.1. Chemical Selection. All potential adverse impacts (environmental, safety, health, etc.) shall be considered in the selection of any chemical. The selection and procurement of chemicals will follow requirements of AFOSH Standard 127-68, Chemical Safety.

5.2. Assignment of a Chemical Hygiene Officer. A qualified CHO will be assigned to develop, implement, maintain, and audit the CHP in accordance with 29 CFR 1910. 1450 (e). A copy of the assignment letter will be provided to the installation's BES, base safety and respective tenant safety office, MPH, environmental management office, and fire protection office.

5.3. Written Chemical Hygiene Plan (CHP). The CHP will be either a unit regulation or section operating instruction. Each lab will maintain a tailored CHP. The format for this plan should follow the outline in Appendix A of 29 CFR 1910.1450. Organizations with multiple laboratories may write a generic CHP with appendices specific to each functional area. Prior to implementation, the plan

must be approved by the Unit Commander, Director, or Functional Manager following coordination with fire, safety, environmental management, and BES. The plan shall meet the requirements of 29 CFR 1910.1450 (e).

5.3.1. Specific work practices and equipment to reduce hazards must be clearly outlined for all laboratory procedures. These measures may be included by reference if the reference is readily available for use by the laboratory workers.

5.3.2. Criteria for abating laboratory worker exposures to hazardous chemicals are presented in the AFI 91-301; AFOSH Standard 161-8, *Controlling Exposures to Hazardous Materials*; and AFOSH Standard 161-17, *Standardized Occupational Health Program*.

5.3.3. Requirements for laboratory-type ("fume") hoods and protective equipment are presented in AFOSH Standard 161-21, *Respiratory Protection Program*; AFOSH Standard 161-2, *Industrial Ventilation*; and AFOSH Standard 127-31, *Personal Protective Equipment*.

5.3.4. Training conducted under AFOSH Standard 161-21, *Hazard Communication*, may fulfill all or part of initial training requirements.

5.3.5. New or changed laboratory operations using new or existing chemicals will be evaluated by the BES as outlined in AFI 48-101 (formerly AFR 161-33), T *he Aerospace Medicine Program*.

5.3.6. Provisions for medical consultations and examinations are presented in AFI 48-101 (formerly AFR 161-33) as implemented by the Aerospace Medicine Council.

5.3.7. The Aerospace Medicine Council (AMC) established according to AFI 48-101 performs the function of a Chemical Hygiene Committee, if one is needed. If problems arise concerning the Chemical Hygiene Program, they will be referred to the AMC for resolution. When the AMC convenes to discuss chemical hygiene problems, the membership should be expanded to include the laboratory supervisor, CHO, and the fire and safety representatives, as a minimum.

5.3.8. Provisions for occupational exposures to particularly hazardous chemicals are presented in AFOSH Standard 127-68 and 29 CFR 1910, Subpart Z. Guidance outlined in these standards should be considered for use as appropriate.

5.4. Employee Information and Training. Laboratory supervisors will assure that employees are provided information and training which apprise them of the hazards present in their work area. Employees shall be informed of and have access to a copy of 29 CFR 1910.1450. Refer to 29 CFR 1910.1450 (f) for the provisions concerning the information and training. This training will be documented on AF Form 55, Employee Safety and Health Record. A master file of all 29 CFR OSHA standards, Volumes I through V, is maintained by the host base safety office. The director of base medical services (usually BES) maintains a master file of 29 CFR OSHA standards that pertain to occupational health.

5.5. Medical Consultation and Medical Examinations. Employees will be provided medical consultation and medical examinations under the circumstances listed in 29 CFR 1910.1450 (g). the local Aeromedical Services will provide medical consultation and examinations for personnel who work with hazardous chemicals per AFI 48-101. Medical opinions required by 29 CFR 1910.1450 (g) (4) will be documented as directed by AFOSH Standard 161-17.

5.6. Mishap or Potential Mishap Reporting. The laboratory supervisor shall report mishaps as required in AFI 91-301. MPH will provide the information required by 29 CFR 1410.1450 (g) (3) to the physician. When a private physician is used, the laboratory supervisor shall notify MPH within 24

hours of a suspected or known overexposure of a civilian to a hazard. the AMC will request the physician to provide a written opinion as required in 29 CFR 1910.1450 (g) (4).

5.7. Hazard Identification:

- Original containers of hazardous chemical will be labeled according to 29 CFR 1910.1450 (h) (1) (i). All other chemical containers in the laboratory, regardless of size or type, will be marked as to contents.
- MSDSs will be maintained according to 29 CFR 1910.1450 (h) (1) (ii) and the unit shall furnish a copy to the BES.
- Provisions for dealing with chemical the substances developed in the laboratory are contained in 29 CFR 1910.145 (h) (2) (i), (ii), and (iii).

5.8. Use of Respirators. The BES will evaluate potential inhalation hazards and determine the need for respirators and, if required, the type of respirators. Respirators will be provided according to 29 CFR 1410.1450 (i), and selected and used in accordance with AFOSH Standard 161-17.

5.9. Record keeping. Records of employee monitoring, medical consultations, and examinations (29 CFR 1910.1450 (j)) will be maintained according to AFOSH Standard 161-17.

5.10. Employee Exposure Determination and notification. Employee exposure determinations and notification shall comply with 29 CFR 1910. 1450 (d). The BES conducts employee exposure determinations whenever there is reason to believe that exposures to a substance routinely exceed the action level or the OEL. The BES provides the employee(s) written notification of any monitoring results within 15 days of receiving analytical data. Notification may be either made individually or by posting results in an appropriate location that is accessible to employees.

ALEXANDER M. SLOAN, Lt General, USAF, MC
Surgeon General

Attachment 1

GLOSSARY OF REFERENCES, ABGREVIATIONS, ACRONYMS, AND TERMS

References

AFI 91-301, *Air Force Occupational Safety, Fire Prevention, and Health (AFOSH) Program* (formerly AFR 127-12).

AFIND 17 *Air Force Occupational Safety and Health(AFOSH) Standards*.

AFOSH Standard 127-31, *Protective Equipment*.

AFOSH Standard 127-32, *Emergency Showers and Eyewash units*.

AFOSH Standard 127-68, *Chemical Safety*.

AFOSH Standard 48-1, (formerly AFR 161-1), *Respiratory Protection Program.*

AFOSH Standard 161-17, *Standardized Occupational Health Program*.

AFOSH Standard 161-2, *Industrial Ventilation*.

AFOSH Standard 161-21, *Hazard Communication*.

AFOSH Standard 161-4, *Exposure To Asbestos.*

AFOSH Standard 161-8, *Controlling Exposures To Hazardous Materials*.

AFR 127-4, *Investigating and Reporting USAF Mishaps.*

OSHA Standard 29 CFR 1910, Subpart Z, *Toxic and Hazardous Substances* (found in OSHA 2077).

OSHA Standard 29 CFR 1910.1030, *Occupational Exposure to Blood borne Pathogens.*

OSHA Standard 29 CFR 1910.1450, *Occupational Safety and Health Standards for Hazardous Chemicals in Laboratories.*

American Conference of Governmental Industrial Hygienists (ACGIH). Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, published annually by the ACGIH.

Federal Standard (FED-STD). FED_STD 313, *Federal Standard, Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities*.

Abbreviations and Acronyms

ACGIH—American Conference of Governmental Industrial Hygienists

AFIND—Air Force Index

AFOSH—Air Force Occupational Safety and Health

AFR—Air Force Regulation

AMC—Aerospace Medicine Council

BEE—Bioenvironmental Engineer

CFR—Code of Federal Regulations

CHO—Chemical Hygiene Officer

CHP—Chemical Hygiene Plan

CONUS—Continental United States

DFARS—Defense Federal Acquisition Regulation Supplement

DRU—Direct Reporting Units

FAR—Federal Acquisition Regulation

FED-STD—Federal Standard

FOA—Field Operating Agencies

GOCO—Government Owned, Contractor Operated

MAJCOM—Major Command

MPH—Military Public Health

MSDS—Material Safety Data Sheets

NCO—Non-commissioned Officer

NDI—Nondestructive Inspection

OEL—Occupational Exposure Limits

OSHA—Occupational Safety and Health Administration

PMEL—Precision Measurement Equipment Laboratories

Terms

Terminology Used:—

Shall.—Indicates a mandatory requirement.

Will.—Indicates a mandatory requirement which expresses a declaration of intent, probability or determination.

Should.—Indicates a preferred method of accomplishment.

May.—Indicates an acceptable or satisfactory method of accomplishment.

Definitions:—Refer to 29 CFR 1910.1450 (b) for definitions with the following additions:

Action Level.—A concentration calculated as an eight(8)-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance. Action levels for certain specific substances are designated in substance-specific 29 CFR part 1910 and AFOSH standards. Action levels for other substances will be determined in accordance with AFOSH Standard 161-8.C., **2.**paragraph 2. and **4.**paragraph 4.b.(2).

Chemical Hygiene Officer (CHO).—(See 29 CFR 1910.1450 for a more complete definition.) This person may be an officer, non-commissioned officer (NCO) or civilian. To act as CHO, an NCO will have attained a 7-level qualification in either a laboratory or bioenvironmental engineering specialty. All CHOs will have a detailed working knowledge of the operating procedure and precautions for the laboratory to which they are named CHO.

Employer.—Shall be interpreted as Commander, Director, or Functional Manager.

Hazardous Chemical.—Any material which is a physical hazard or health hazard as defined in Federal Standard 313, *Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities*.

Occupational Exposure Limit (OEL).—The concentration of a specified substance greater than which an employee will not be routinely exposed. The term OEL includes 8-hour Time weighted Average Limit, Short Term Exposure Limits, Ceiling Limits, and Excursion Limits that apply to a specified substance. For each substance, the OEL is the most stringent limits found in the latest edition of "Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices" published by the American Conference of Governmental Industrial Hygienists, the AFOSH Standard for the specific substance (if published), and 29 CFR 1910 Subpart Z.